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The creation of high temperature steam flow for plasma chemical gasification of polymer waste

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Abstract

© Research India Publications. The process of water steam plasma in the gas discharge with liquid electrolyte cathode was studied experimentally. The studies demonstrated the fact that the steam water plasma contains no ballast components, such as nitrogen in the composition of air plasma. Due to this, it is effective as a power supply, which is used in plasma-chemical reactors intended for recycling. The mechanisms of harmful oxides development such as nitrogen and sulfur oxides are suppressed in steam water plasma. Therefore, the most favorable environmental conditions will be provided. An aqueous solution of sodium chloride in distilled water was used as an electrolyte. The experiments were carried out in the range of 4-11 A currents. The current density based on liquid cathode is maintained within 0. 8-1. 0 A/cm2. The energy balance was studied. The heat loss on the electrodes is determined by the calorimetric method. The regularities of flow electrolyte kinematic parameter influence on the energy characteristics of the plasma generator are revealed. The optimal mode of electrolyte flow through the cathode assembly of the plasma generator is established. The heat loss on the cathode is reduced significantly due to the changes of the flow electrolyte velocity. The possibility of steam water plasma use for the gasification of organic waste is demonstrated. A salable product represented by synthesis gas is obtained from plastic waste. The chromatographic analysis of the synthesis gas is performed. It was revealed that the synthesis gas, which is formed from polyethylene waste, contains less ballast components in the form of carbon dioxide. The prospects of plasma generator use with liquid electrolyte cathode for polymer waste gasification are determined experimentally.

Keywords

Liquid cathode, Plasma generator, Steam water plasma, Synthesis gas